

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**



# PATENT SPECIFICATION

654,460

Date of filing Complete Specification : July 14, 1949.

Application Date : June 15, 1948. No. 16035/48.

Complete Specification Published : June 20, 1951.

Last page

Index at Acceptance :—Class 94(ii), D1bD4(a : c : h : i : m), E2(a : c).

## PROVISIONAL SPECIFICATION.

SPECIFICATION NO. 654460

INVENTOR:— JOHN WILLIAM RANDALL

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of John Dickinson & Co. Limited, a British Company, of Apsley Mills, Hemel Hempstead, Hertfordshire.

THE PATENT OFFICE,  
28th July, 1951

DS 88858/1(26)/3558 160 7/51 R

10 The present invention relates to bags and  
like containers, including transparent and  
part-transparent display bags and display  
containers, of the kind having flexible walls  
which enable the articles to be collapsed  
15 to a flat or substantially flat condition when  
not in use.

It is now a well known practice to produce such bags or containers, hereinafter referred to as bags, by the method of forming  
20 a continuous bag-tube or successive individual bag-tubes in a bag-making machine, severing the required tubular bag-lengths from the tube when the latter is continuously formed, and then sealing one end of each severed bag length or individual  
25 bag tube and folding the latter when necessary to complete the bag.

The bags produced in the manner above described, particularly in the case of transparent or part-transparent display bags, are usually made of a comparatively thin, flexible sheet material which lacks rigidity and is comparatively frail, so that such bags, as hitherto made, are unable properly to  
30 maintain the desired packed shape or properly to protect their contents when filled and moreover, are liable to rupture under the strain of their contents. A further disadvantage of such bags of a transparent or part transparent nature  
40 resides on the fact that the transparent sheet material, usually a cellulosic film, used in the manufacture thereof forms a bad background for the display of printed matter and like inscriptions.

45 The primary object of the present invention is to provide a modified and improved

thin, flexible material, a piece or pieces formed of comparatively stiff sheet material is or are located in juxtaposed relation to the flexible tube-forming material in such a manner as to become enclosed in and/or  
60 united with the formed bag-tube and subsequently to form a reinforcement for pre-selected parts of the completed bag.

The present invention also provides a collapsible bag or like container comprising a tubular bag section of comparatively thin flexible sheet material having one end thereof sealed and one or more pieces of a comparatively stiff sheet material applied  
65 to the bag-tube in the formation thereof so as to reinforce pre-selected parts of the completed bag.

According to one feature of the invention, the reinforcing piece or pieces may comprise an insert or inserts which is or are preferably adapted to reinforce the bottom and  
75 at least one side wall of the bag.

According to another feature of the invention, the reinforcing piece or pieces may be applied and secured to the external surfaces of the bag and preferably adapted to reinforce the bottom and at least one side wall of the bag.

The reinforcing piece or pieces may be secured to the surfaces of the bag by any suitable means e.g. by sewing, stapling or by a suitable adhesive such as gum or by the use of heat-sealable films and, in some cases, by interfolding with the folds of the bag where these are present.

90 For most purposes, the reinforcing piece or pieces may be arranged to strengthen the bottom and front wall and/or rear wall of

inner

outer



Date of filing Complete Specification : July 14, 1949.

Application Date : June 15, 1948. No. 16035/48.

Complete Specification Published : June 20, 1951.

Index at Acceptance :—Class 94(ii), D1bD4(a : c : h : i : m), E2(a : e).

### PROVISIONAL SPECIFICATION.

#### Improvements in or relating to Collapsible Bags and like Containers.

We, JOHN WILLIAM RANDALL, a British Subject of "Longueville", Green End, Boxmoor, Hemel Hempstead, in the County of Hertford, and JOHN DICKENSON & Co. LIMITED, a Company Incorporated under the Laws of England, of Apsley Mills, Hemel Hempstead, in the county of Hertford, do hereby declare the nature of this invention to be as follows:—

10 The present invention relates to bags and like containers, including transparent and part-transparent display bags and display containers, of the kind having flexible walls which enable the articles to be collapsed to a flat or substantially flat condition when not in use.

15 It is now a well known practice to produce such bags or containers, hereinafter referred to as bags, by the method of forming a continuous bag-tube or successive individual bag-tubes in a bag-making machine, severing the required tubular bag-lengths from the tube when the latter is continuously formed, and then sealing one end of each severed bag length or individual bag tube and folding the latter when necessary to complete the bag.

20 The bags produced in the manner above described, particularly in the case of transparent or part-transparent display bags, are usually made of a comparatively thin, flexible sheet material which lacks rigidity and is comparatively frail, so that such bags, as hitherto made, are unable properly to maintain the desired packed shape or properly to protect their contents when filled and moreover, are liable to rupture under the strain of their contents. A further disadvantage of such bags of a transparent or part transparent nature resides on the fact that the transparent sheet material, usually a cellulosic film, used in the manufacture thereof forms a bad background for the display of printed matter and like inscriptions.

45 The primary object of the present invention is to provide a modified and improved

method of producing bags of the kind set forth having a reinforced construction which obviates the disadvantages referred to above.

Accordingly, the present invention provides a method of manufacturing collapsible bags and like containers whereby, in the formation of the bag-tube from a web or webs or sheet or sheets of comparatively thin, flexible material, a piece or pieces formed of comparatively stiff sheet material is or are located in juxtaposed relation to the flexible tube-forming material in such a manner as to become enclosed in and/or united with the formed bag-tube and subsequently to form a reinforcement for pre-selected parts of the completed bag.

The present invention also provides a collapsible bag or like container comprising a tubular bag section of comparatively thin flexible sheet material having one end thereof sealed and one or more pieces of a comparatively stiff sheet material applied to the bag-tube in the formation thereof so as to reinforce pre-selected parts of the completed bag.

According to one feature of the invention, the reinforcing piece or pieces may comprise an insert or inserts which is or are preferably adapted to reinforce the bottom and at least one side wall of the bag.

According to another feature of the invention, the reinforcing piece or pieces may be applied and secured to the external surfaces of the bag and preferably adapted to reinforce the bottom and at least one side wall of the bag.

The reinforcing piece or pieces may be secured to the surfaces of the bag by any suitable means e.g. by sewing, stapling or by a suitable adhesive such as gum or by heat-sealable films and in some cases, by interfolding with the folds of the bag where these are present.

For most purposes, the reinforcing piece or pieces may be arranged to strengthen the bottom and front wall and/or rear wall of

the bag and the lower end of the reinforcing piece or each such piece may be scored, creased or otherwise hinged to facilitate the folding over of an end area thereof corresponding to the base or bottom of the bag so that the hinged end portion is adapted to fold so as to lie flat against the remainder of the reinforcing piece when the bag is collapsed and to extend across the base substantially at right angles to the walls of the bag when the latter is opened for filling.

When the reinforcing material is applied in the form of separate oppositely disposed pieces to reinforce the front and rear walls of a gusset-sided bag, score lines or other weakening fold-defining lines may be made at a distance from the lower end of the said pieces to provide hinged flaps of approximately half the width of the side wall i.e. the depth of the gusset, so that when the bag is opened for filling, the hinged flaps will assume a position covering the bag bottom with the two bottom edges of the piece in juxtaposition.

If it is desired to cover the gap or line of abutment between the aforementioned folded edges of the reinforcing pieces, provision may be made of a cover piece which may be in the form of a loose insert, or may be attached to one of the wall reinforcing pieces and adapted to be hingedly folded over substantially to cover the area of the bag bottom.

In a modification of the last described arrangement, where it is desired to provide additional strength to the bottom and one wall only of the pack, the reinforcing piece applied to one of the walls may be utilised to form the bottom covering flap. This may be achieved by allowing a portion of the said piece to extend upward beyond the line of weakening for a distance corresponding substantially to the width of the bottom and to remain unsecured over the aforementioned extended area to enable it to be folded inwardly when required.

It will be appreciated that although the last described arrangements are particularly well suited to bags of gusset sided formation, they could be adapted for use with flat bags if so desired.

\* Furthermore, many other types of tubular bags incorporating the use of reinforcing pieces are within the scope of this invention. For instance, in the case of bags known generally in the trade as block bottom and self opening satchel bags, the reinforcing pieces may conveniently ~~have~~ <sup>be</sup> adapted to the lower ends thereof "V" shaped to conform to the usual diamond formation of the bag bottom. The shaped ends of the reinforcing pieces not only serve as strengthening and stiffening members but also assist the folding of the bag tube in the formation of the bag bottom. In this

connection it may be found advisable with certain materials to pre-crease the reinforcing pieces to conform to the bottom folds.

The "V" shaped portions of the above mentioned reinforcing pieces will, of course, only provide local reinforcement to the half diamond "ears" of the bag bottom and therefore in some cases it may be found necessary to apply a patch or cover piece to complete the stiffening of the bottom.

The said patch may conveniently be applied to the bag tube during the formation of the block bottom, and immediately prior to folding over the half diamond "ears". The subsequent folding of the ears will then partially enclose the said patch.

In the case of bags of the flat or satchel block bottom formation it has been found that instead of applying the reinforcing pieces to the front and rear walls of the bag tube they may, with considerable advantage, be applied to the areas of the bag tube or web which subsequently become the gussets or side walls of the bags. This not only assists in the formation of block bottom when manufacturing bags from films or known character, such as regenerated cellulose, but also provides a complete reinforcement of the bag bottom without the application of a further patch.

The reinforcing pieces may extend substantially to the lower extremity of the bag tube so that they may be severed in the normal operation of severing the bag lengths, if supplied from a web or webs of the reinforcing material.

The mouths of the bags made according to this invention, may be adapted for closure in known manner, such as for instance by sealing by the application of heat and pressure to heat-sealable films preferably applied direct to the walls of the bag tube, in which case the reinforcing piece or pieces may be arranged to terminate short of the top of the bag tube walls. Alternatively, the reinforcing piece or pieces may be extended up to or beyond the top edge of the bag and adapted to close inwardly over the contents of the bag, thus exposing an area of the bag tube walls at the mouth of the bag for sealing purposes. In a further modified form, the said reinforcing pieces may remain extended for sealing in co-operation with the sealing area at the bag mouth and may be adapted, *per se* for heat sealing.

The means for effecting a satisfactory closure of the bags include the use of adhesive tape, metal clips, staples, stitching etc.

Means may conveniently be provided for carrying the bags produced according to the present invention. For example, an aperture cut in the said extended reinforcing strip or strips would quite well serve this purpose.

70

75

80

85

90

95

100

105

110

115

120

125

130

Apparatus suitable for carrying the method of the present invention into effect may comprise means adapted to feed material for forming the bag tube either by drawing it from a reel in web form, or extracting and advancing pre-cut sheets from a wad; similar alternative means adapted to feed and advance the reinforcing material to a position for uniting with the said bag tube material prior to the formation of the bag tube, means for uniting the said materials in the formation of the bag tube and folding means adapted to create the tube or folds of the bag and enclose the reinforcing pieces therein. The apparatus may also, where necessary, comprise means to effect severance of the completed bag tube in the desired bag lengths, means for scoring or otherwise weakening the reinforcing pieces at the fold lines and means for folding the bag bottom and effecting delivery of the finished bag.

One manner of carrying the method of the present invention into effect in the production of gusset sided bags made from a single web, and provided with two reinforcing pieces, one of which is intended to be used as the bottom cover flap, is hereinafter described merely by way of example and without implied limitation.

The reinforcing material which may, for instance, be of cardboard, strawboard, or paper of suitable stiffness, may be pre-cut into strips or sheets and fed from two stations by suitable feeding means, or in a manner preferred, drawn from reels and severed either before or after contacting the bag tube web as will hereinafter be described.

To facilitate folding the lower portion of the said reinforcing strips or sheets to conform to the bag bottom provision may be made of means adapted to crease or create other lines of weakening and preferably arranged to carry out this operation during the transfer of the said reinforcing strips or sheets to the tube-forming web.

The said reinforcing material may have inherent heat-sealing properties, or it may be treated with suitable heat sealing film by coating or applying in strip form at appropriate positions.

Alternatively, or in addition, the adhesive or heat-sealing film may be applied to the tube-forming web as it is drawn from the reel, or the said web may consist of heat-sealing film.

The said web, which may conveniently be

of regenerated cellulose, moistureproof film, or suitable heat sealing film as mentioned above, may be drawn from a reel and caused to unite with the reinforcing material for subsequent attachment by heat-sealing means provided for this purpose. The first strip or sheet of reinforcing material is then applied to the tube-forming web and the combination forwarded through mechanism provided to form the gusset, from where it is carried to unite with the second reinforcing strip or sheet for heat-sealing.

The reinforcing strips or sheets are so positioned on the tube-forming web, that the aforementioned lines of weakening coincide with the front and rear edges of the bag bottom when the completed bag is opened for use.

After the introduction of the second reinforcing strip or sheet, the assembly is further advanced to the position where the final longitudinal tube fold is created and the longitudinal seam is sealed.

The bag tube is then severed into sections of desired length to form the bags, each of said lengths being conveyed to suitable apparatus for forming or folding the bag bottom in known manner and finally the completed bags are carried by means adapted to deliver and stack.

A bag thus made may be stored in flat condition and made ready for use by opening the gusset folds and thereby forming the bag bottom, which in turn may be further reinforced by folding inwardly the extension flap provided for this purpose in one of the reinforcing strips or sheets as hereinbefore described.

Printing or other decorative matter may be applied to the bag with the reinforcing strips providing a good background thereto, or the decorative matter could, with advantage be applied direct to the outer face of one or more of the reinforcing strips or sheets.

It will be clear that by the method of the present invention a well shaped, appreciably rigid pack reinforced at the points of maximum strain can be provided and by using a suitable transparent material for the bag tube such a pack may be formed with suitably reinforced and stiffened areas associated with a display panel or panels.

Dated this 15th day of June, 1948.

McKENNA & CO.,  
12 Whitehall, S.W.1.  
Applicants' Solicitors.

#### COMPLETE SPECIFICATION.

#### Improvements in or relating to Collapsible Bags and like Containers.

We, JOHN WILLIAM RANDALL, a British Subject of "Longueville", Green End, Boxmoor, Hemel Hempstead, in the

County of Hertford, and JOHN DICKENSON & Co. LIMITED, a Company Incorporated under the Laws of England, of Apsley Mills,

Hemel Hempstead, in the County of Hertford, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to bags and like containers of the flat bottomed type—including transparent and part-transparent display bags and display containers, of the kind having flexible walls which enable the articles to be collapsed to a flat or substantially flat condition when not in use, and a bottom end formation which automatically assumes a flat-bottom condition or is adapted to be manipulated by the fingers of the hand into such a condition when the bag is in use.

It is now a well known practice to produce such bags or containers, hereinafter referred to as bags, by the method of forming a continuous bag tube or successive individual bag tubes in a bag-making machine, severing the required tubular bag-lengths from the tube when the latter is continuously formed, and then sealing one end of each severed tubular bag-length or individual bag-tube and folding the latter when necessary to complete the bag.

The bags produced in the manner above described, particularly in the case of transparent or part-transparent display bags, are usually made of a comparatively thin, flexible sheet material which lacks rigidity and is comparatively frail, so that such bags, as hitherto made, are unable properly to maintain the desired packed shape or property to protect their contents when filled and, moreover, are liable to rupture under the strain of their contents. A further disadvantage of such bags of transparent or part-transparent nature resides in the fact that the transparent sheet material, usually a cellulosic film, used in the manufacture thereof forms a bad background for the display of printed matter and like inscriptions.

In order to overcome the disadvantages referred to above, it has previously been proposed to provide such collapsible bags and containers with reinforcing inserts in the form of pieces and/or strips of a comparatively stiff material such as cardboard, millboard or pasteboard and according to one such proposal in constructing a block-shaped bag either by hand or in a bag-making machine, from bag tubing made of paper or similar material with inwardly turned lateral folds, i.e. longitudinal gussets, the walls thereof without lateral folds or

gussets are stiffened over their entire width by means of strips of cardboard pasted on to the bag-tube material prior to pasting and forming the bag tubing, the said strips of cardboard having a width equal to the width of the said walls and a length such

as to produce a reinforced bag tube with reinforced open ends which are adapted to be folded subsequently by hand or mechanically to form the bag tubing into a block-shaped bag or package with two stiffened or reinforced unfolded side walls and stiffened or reinforced top and bottom.

The primary object of the present invention is to provide a modified and improved method of producing bags of the kind set forth with a reinforced construction which obviates the disadvantages referred to above.

Accordingly, the present invention provides a method of manufacturing flat-bottomed type collapsible bags and like containers whereby a web or webs or a piece or pieces of flexible bag-tube material is or are mechanically fed to a bag-tube forming mechanism, and one piece or two or more pieces of a comparatively stiff sheet material suitably creased or otherwise weakened for subsequent folding is or are mechanically presented to and brought into face-to-face relation with each bag length of the bag-tube material so as to become united therewith in the formation of the bag-tube from the bag-tube material and whereby one end of the formed bag-tube and the corresponding parts of the reinforcing piece or pieces applied to the bag-tube are mechanically folded and sealed to complete a bottom for the bag and so that when the latter is opened for use the reinforcing pieces adopt a position wherein to define a flat bottom to the bag and to reinforce the bottom and at least one longitudinal wall of the bag.

The present invention also provides apparatus for carrying the above described method into effect and, to this end, comprising, means for feeding a continuous web of bag-tube material to bag-tube forming mechanism, means for coating the longitudinal seaming areas and reinforcement areas of each bag length of the web with an adhesive substance, means for bringing a succession of suitably creased or otherwise weakened reinforcing pieces into face-to-face contact with the adhesive-coated areas of the web, means for forming each bag-length of the reinforced web into the requisite bag-tube, means for applying an adhesive substance to the bag-tube lengths at one end thereof and folding and sealing the adhesive-coated ends to form reinforced bottoms to the bags, and means for delivering the formed bags.

In carrying the method of the invention into effect the reinforcing pieces may be secured to internal and/or external surfaces of the bag.

The reinforcing pieces may be secured to the surfaces of the bag by any suitable means e.g. by sewing, stapling or by a

suitable adhesive such as gum or by the use of heat-sealable films and, in some cases, by interfolding with the folds of the bag where these are present.

- 5 For most purposes, the reinforcing pieces may be arranged to strengthen the bottom and unfolded front wall and/or unfolded rear wall of the bag or, alternatively, the bottom and folded side walls of the bag, and the lower end of the reinforcing pieces may be scored, creased or otherwise hinged to facilitate the folding over of end areas thereof corresponding to the base or bottom of the bag so that the hinged end portion is adapted to fold so as to lie flat against the remainder of the reinforcing pieces when the bag is collapsed and to extend across the base substantially at right angles to the walls of the bag when the latter is opened for filling.

20 To enable the invention to be clearly understood and readily carried into effect it will hereinafter be more fully described with reference to the accompanying diagrammatic drawings in which:—

25 Fig. 1 is a schematic side elevational view of one form of apparatus for carrying the method of the present invention into effect;

30 Figs. 2, 3 and 4 are line perspective views of certain constructional stages of a reinforced plain satchel bag as produced by the apparatus shown in Fig. 1;

35 Fig. 5 is a schematic side elevational view of an alternative form of apparatus for carrying the method of the invention into effect;

40 Figs. 6, 7 and 8 are line perspective constructional views of a block bottom non-self-opening bag produced by the apparatus shown in Fig. 5;

45 Fig. 9 is a schematic view of a further alternative form of apparatus for carrying the method of the present invention into effect;

50 Figs. 10, 11 and 12 are line perspective constructional views of a block bottom self-opening satchel bag produced by means of the apparatus shown in Fig. 9;

55 Fig. 13 is yet another alternative form of apparatus for carrying the method of the present invention into effect, and

60 Figs. 14, 15 and 16 are line perspective constructional views of a flat or block bottom self-opening satchel bag produced by means of the mechanism shown in Fig. 13, and

65 Figs. 17, 18 and 19 are line perspective constructional views of a flat or block bottom non-self-opening bag produced by means of the mechanism shown in Fig. 13.

The term "self-opening satchel bag" as used herein is intended to define a bag having gusseted side walls and a block bottom which is adapted to open to a flat

condition automatically when the bag is filled; "plain satchel bag" defines a bag having gusseted side walls and some form of flat-opening but not truly block bottom which usually needs to be manipulated by the fingers of the hand to produce the flat bottom condition when the bag is in use; while "block bottom non-self-opening bag" is intended to define a bag with block bottom formation but without gusseted side walls. It will be appreciated that every type of bag herein described and shown exhibits or may be manipulated to exhibit a flat bottom when opened out in use.

In the formation of the plain satchel bag shown in Figs. 3 and 4 of the accompanying drawings, a tubular bag length 1, as shown prior to folding in Fig. 2, is provided with longitudinal side gussets 2 and reinforcing material is applied to the bag in the form of oppositely disposed pieces 3, 4 to reinforce the unfolded front and rear walls 5, 6 of the bag. The reinforcing pieces 3, 4 are secured to the inner faces of the bag walls 5, 6 while transverse score lines, creases or other weakening fold-defining lines 7 are made in the reinforcing pieces at appropriate distances from the lower ends thereof to provide hinged flat-bottom-forming flaps 9, 10 having a width which is approximately half that of the folded side walls of the bag i.e. equal to the depth of the gussets 2; thus as shown in Fig. 4, when the bag is opened for filling, the hinged flaps 9, 10 will assume a position covering the bag bottom with the bottom end edges of the flaps in juxtaposition.

If it is desired to cover and reinforce the gap or line of abutment between the opposed edges of the flaps 9, 10 of the reinforcing pieces, provision may be made of a patch or cover piece 11 which may be in the form of a loose insert or may be hingedly attached to one of the wall-reinforcing pieces and adapted to be folded over so as substantially to cover the flaps 9, 10 and the area of the bag bottom.

In a modification of the last described arrangement, where it is desired to reinforce the bottom and one side only of the bag, the reinforcing piece 4 may be utilised to provide both the flap 10 and patch 11. This may be achieved by allowing the upper portion of the piece 4 which lies above the fold line 7 to extend for a distance corresponding substantially to the width of the bag bottom and to remain free from the walls of the bag over the aforesaid extended area to enable it to be folded downwardly to lie upon the flap portion 10 and cover the bag bottom when the bag is opened.

The above described form of reinforced bag may be produced in accordance with the method of the present invention by

means of the apparatus shown in Fig. 1 wherein 12 indicates a reel for feeding a continuous web W of bag-tube material such as cellulose acetate film. 13 indicates means for applying gum or other adhesive to the internal seaming and reinforcing surface areas of the web; 14 is a first reel for supplying the reinforcing material in the form of a continuous web R; 15 is a draw-off, creasing and web-severing section associated with the web-feeding reel 14; 16 is a first gusset fold section; 17 is a second reel for the supply of a continuous web R1 of reinforcing material; 18 is a draw-off, creasing and severing section associated with the web-feeding reel 17; 19 is a second gusset-forming section; 20 indicates the means for severing the bag-tube lengths from the web; 21 the means for applying gum or other adhesive to the bottom or tail end of the separated bag-tube lengths and tucking-in and turning up the gummed ends thereof; while 22 indicates a gripper cylinder for delivering the completed bags.

In the operation of the above described apparatus, the web W of tube-forming material is drawn from the reel 12 by draw rolls 37, passed between the wrap rolls 23 and then between the gummer roll 24 and pressure rolls 25 of the adhesive-applying means 13 and then passed between the uniting roller pair 26; at the same time, the web R of the reinforcing material, e.g. cardboard, is drawn between wrap rolls 27 from the reel 14 by draw rolls 28, provided with the transverse crease or fold lines 7 by creasing rolls 29 and then brought into face-to-face contact with the adhesive-coated reinforcement areas of the web W in passing therewith between the rolls 26, while the web R is separated by severing knife means 30 into the sections of the requisite length for the reinforcing pieces 3. The web W, with reinforcing pieces 3 attached thereto, (Fig. 2), then passes through the gusset-folding section 16 which folds the longitudinal side gussets 2 over the edges of the reinforcing pieces 3 and the gusset-folded web W is then passed beneath the delivery roller pair 31 of the section 18. A second web R1 of reinforcing material is drawn from the reel 17 by wrap rolls 32 and draw rolls 33 of the section 18 and the last mentioned web is transversely creased by the creasing rolls 34 and then superimposed upon the web W and reinforcing pieces 3 after passing between the delivery rollers 31, while the web R1 is separated by the severing knife means 35 into sections of the requisite length for the reinforcing pieces 4. The web W, carrying the superimposed reinforcing pieces 3, 4 then passes through the second gusset-folding section 19 which completes the longitudinal side gusset folds 2 and forms the web into the tubular bag

shape with the adhesive-coated longitudinal seaming areas thereof brought into juxtaposed relation and the adhesive-coated reinforcing areas brought into contact with the reinforcing pieces 4. The tubular web in that folded form passes over guide rolls 36 and is forwarded by draw rolls 37 to rotary severing knife means 38 whereby the web is separated into the tubular bag lengths 1 which pass between ironing rolls 39 and are thereby sealed along their longitudinal seams.

The sealed, reinforced tubular bag lengths 1 are then conveyed between endless conveyor and clamping tapes 40 to the adhesive-applying and tucking-in section 21 whereby the tail ends of the tubular bag lengths are coated with adhesive, folded over with a single or double turn-up, as desired, and the bottom ends of the gussets 2 tucked in to provide the bottom opening pleats of the bag.

The complete bag as shown in Fig. 3 is thereupon transferred to and delivered in flat folded condition by the gripper cylinder 22.

Many other types of reinforced tubular bags may readily be produced by the method of the present invention, for example any of the bags known in the trade under the terms hereinabove defined.

As shown in Figs. 6, 7 and 8 an internally reinforced block bottom non-self-opening bag produced by the method of the present invention comprises a bag length 41 longitudinally seamed and sealed to form a tubular bag with plain unfolded side walls 42 and oppositely disposed reinforcing pieces 43, 44 which reinforce the front and rear walls 45, 46 of the bag and extend along the major part of the length thereof. The reinforcing pieces 43, 44 have the lower ends thereof conveniently V-shaped to conform to the usual diamond formation of the bag half-bottom. The reinforcing pieces are secured to the inner faces of the bag walls 45, 46, while transverse score lines, creases or other weakening fold-defining lines 47 are made in the reinforcing pieces at appropriate distances from the lower ends thereof to provide hinged V-shaped flaps 49, 50. The V-shaped flaps not only serve as bottom strengthening and stiffening members but also assist in the folding of the bag tube in the formation of the block bottom of the bag.

The V-shaped flaps 49, 50 of the reinforcing pieces 43, 44 will, of course, only provide reinforcement to the half diamond "ears" 49a, 50a of the bag bottom and therefore it is essential to apply a blocking patch or cover piece 51 to complete the stiffening or blocking of the bottom of the bag. The blocking patch 51 may conveniently be applied to the bag tube during the



formation of the bag-bottom and immediately prior to the folding over of the half diamond ears. The subsequent folding of the ears will then partially enclose the patch.

A further transverse crease or fold line 48 is defined in the reinforcing pieces 43, 44 to enable the block bottom of the bag to fold flat against the walls thereof when the bag is not in use.

Apparatus for producing the last described form of reinforced tubular bag by the method of the present invention is shown in Fig. 5 in which 62 is a supply reel for feeding the web W of the bag-tube material; 63 is an adhesive-applying means for applying gum or other adhesive to the longitudinal seaming areas and reinforcing areas of the web W; 64 is a first feed hopper for feeding pre-formed strips or pieces 43 of reinforcing material, e.g. cardboard. 65 is a draw-off, creasing and forwarding section associated with the feed hopper 64; 66 is a pair of rolls for uniting the web W to the reinforcing pieces 43; 67 is a second feed hopper for feeding pre-formed strips or pieces 44 of reinforcing material, e.g. cardboard; 68 is a second creasing and forwarding section associated with the second feed hopper 67; 69 is a bag-tube forming section; 70 indicates knife means for severing the bag-tube lengths from the web; 71 the means for applying adhesive to the bottom or tail end of the separated bag tubes; 73 a feed hopper and associated means for feeding blocking patches 51 to the open bottom or tail ends of the bag-tubes; 74 a bottom folding section comprising means for tucking-in the half diamond tail ends of the bag tubes and reinforcing pieces; while 72 indicates means for delivering the completed bags.

In the operation of the last described form of bag making apparatus, the web W is drawn from the reel 62 by the draw rolls 80, passed between wrap rolls 75, supplied with adhesive by passing between the gummer roll 77, and pressure rolls 76 of the adhesive-applying section 63, and then passed between the uniting roll pair 66.

Reinforcing strips or pieces 43 are fed from the hopper 64 through the forwarding section 65 and provided with transverse scoring lines or creases 47, 48 by creasing rolls 78. The reinforcing pieces 43 are brought into face-to-face contact with the adhesive-coated surfaces of the web W and united therewith in passing between the rollers 66. The united web and reinforcing pieces pass between a draw roller pair 69a and, at this stage, a second reinforcing strip or piece 44, fed from the hopper 67 and transversely creased or scored by the creasing rolls 79 in passing through the

draw-off, creasing and forwarding section 68, is superimposed upon each reinforcing piece 43 secured to the web W.

The web W and superimposed reinforcing pieces 43, 44 then pass between the roller pair 69a and are fed thereby to the bag-tube forming section 69 wherein the web is progressively formed into the requisite bag-tube with the longitudinal adhesive-coated edges thereof brought into overlapping contact and adhesive-coated reinforcing areas in face-to-face contact with the reinforcing pieces 44. The formed bag-tube is then passed by the draw rolls 80 between the blades of the severing knife section 70 and over a table 81a and beneath a plough 81 which lifts and turns back about its fold line 48 the bottom end of each reinforcing piece 44 so that the latter carries back therewith the corresponding part of the upper seamed wall of the tubular bag web. The bag-tube lengths are separated one by one from the web by means of the severing knife section 70 and each separated bag-length is then carried between the gummer roll 82 and backing roll 83 of the adhesive applying section 71 so that the inner faces of the V-ends of the reinforcing pieces 43 are coated with adhesive. Thereafter a blocking patch 51 is drawn from the hopper 73 by the rotary gripper cylinder 84 and deposited upon the upwardly facing adhesive-free inner surfaces of the front and rear walls of the bag tube lying to the inner sides of the fold lines 47. The bag tube then passes between the gripping cylinder 84 and co-operating roll 85 to a bottom-folding section 74 whereupon the tucker blade 87 tucks the adhesive-coated V-shaped ends of the reinforcing pieces, 43, 44 and half diamond ears of the bag tube about the inserted blocking patch 51.

The tucking, folding and sealing of the bottom of the bags is completed as each bag passes between the co-operating rolls 85, 86 and between the roll 85 and co-operating endless tapes 88, and the completed bags are discharged therefrom on to a delivery table or travelling conveyor 72.

Figs. 10, 11 and 12 show an internally reinforced block-bottom self-opening satchel bag as produced by the method of the present invention. The last mentioned type of bag is constructed upon similar lines to the block bottom non-self-opening bag of Fig. 8 the essential differences being that the self-opening satchel bag is provided with longitudinal side gussets 2 as in the case of the plain satchel bag described with reference to Fig. 4.

The reinforcements and general parts and arrangement of the flat folding block bottom of the bag shown in Fig. 12 are identical to those described above with reference to

Fig. 8 and are identified by similar references in the aforesaid corresponding figures of the drawings.

Apparatus for constructing the last mentioned bag by the method of the present invention is shown in Fig. 9. The said apparatus is similar in the main to the apparatus described above with reference to Fig. 5, and the similar parts are identified by similar references.

In the apparatus shown in Fig. 9 however, the web W carrying the reinforcing pieces 43 passes beneath the delivery rollers 69a which serve to superimpose the reinforcing pieces 44, fed from the hopper 67, upon the pieces 43. Moreover, the bag-tube forming means 69 is omitted and the apparatus is provided in place thereof with first and second gusset fold sets 89, 90 which serve, as described with reference to Fig. 1, to impart longitudinal gusset folds to the bag tube web and to complete the formation of the bag tube.

In the case of bags of either the self-opening satchel kind or non-self-opening block kind it has been found that instead of applying the reinforcing pieces to the front and rear walls of the bag tube they may, with considerable advantage, be applied to the areas of the bag tube or web which subsequently become the gusseted or plain side walls of the bags. This not only assists in the formation of the flat or block bottom when manufacturing bags from films of known character, such as regenerated cellulose but also provides a complete reinforcement of the bag bottom without the application of a further patch.

The reinforcing pieces may extend substantially to the lower extremity of the bag tube so that they may be severed in the normal operation of severing the bag lengths, if supplied from a web or webs of the reinforcing material.

The side wall reinforcing pieces may be applied either internally or externally of the bags and a convenient arrangement embodying internal application of reinforcing strips to a block bottom self-opening satchel bag is shown in Figs. 14, 15 and 16. Referring to Fig. 14 it will be seen that the bag length 91 is produced in the usual tubular form with overlapping longitudinal seam 91a. Reinforcing pieces 93, 94 equal in width to the width of the side walls of the opened bag, are applied to the bag blank or web so as to extend to an equal distance to either side of the longitudinal edges of the front and rear wall areas of the blank and from end to end thereof.

Gusset folds 92 are formed in the reinforced longitudinal walls of the bag-tube 91 and the bag-tube and reinforcing pieces are transversely creased to provide fold lines 97, 98.

The bottom ends of the gusset-folded side walls are then opened out flat and folded about transverse fold lines 100 to define rectangular flaps 93b, 94b joined to the lower end part of the side walls by the tucked-in half diamond shaped sides 93a, 94a, 93c and 94c of the infolded side wall pleats. The rectangular flaps 93b, 94b are joined at their longitudinal edges by the bottom ends 95a, 96a of the front and rear walls 95, 96 of the bag-tube. Each of the wall portions 95a, 96a is divided by crease lines into three half diamond fold sections so that the parts will fold inwards about the fold lines 97 to form half diamond flaps beneath the rectangular reinforcing 93b, 94b when the latter are infolded about the fold lines 100 to form the block bottom of the bag as shown in Fig. 16. The blocked bottom thus formed is adapted to turn about the fold line 98 so as to lie flat against the rear wall of the bag (as shown in the Fig. 15 detail) or to be moved through approximately 90° to form the block bottom of the opened bag as shown in Fig. 16.

As shown in Figs. 17, 18 and 19, the side wall reinforcing pieces 93, 94 are equal in width to the width of the side walls of the opened bag and are applied externally to the areas of a bag tube 91 which will subsequently become the plain side walls of the bag formed therefrom so as to extend to an equal distance to either side of the longitudinal fold lines of the flat folded bag tube and from the bottom end thereof. The bottom ends of the reinforced tube are creased to define transverse fold lines 97, 98 while the ends of the side walls of the bag tube and ends 93b, 94b of the reinforcing pieces are infolded about the ends of the fold lines 100 to define a flat block bottom similar to that described above with reference to Fig. 16 but having the end half diamond pleats 93a, 94a, 93c, 94c thereof outwardly directed and the bottom ends 95a, 96a of the front and rear walls 95, 96 of the bag folded to half diamond shape and adapted to hinge about the fold lines 97 so as to fold about the block bottom of the bag. The block bottom thus formed is adapted to lie more or less flat against the rear wall of the bag when not in use (Fig. 18) and to assume the position shown in Fig. 19 when the bag is opened for use.

As in the construction shown in Fig. 16, a reinforcing patch 101 may be inserted in the block bottom of the bag as a double reinforcement.

Apparatus for producing block-bottom self-opening satchel bags with internally reinforced gusset folded side walls of the kind described above is shown in Fig. 13. It will be seen that the apparatus includes a reel 112 for feeding a web W of bag-tube material to gusset-forming sections 116; 130

an adhesive applying section 113 for applying adhesives to the longitudinal seaming areas and reinforcing areas of the web W; a pair of reels 114 and associated forwarding, creasing and severing sections 15 for simultaneously feeding parallel webs R, R1 of the reinforcing material and superimposing the reinforcing pieces 93, 94 upon the web; and roll pairs 126 including lift rolls 126a for uniting the web and reinforcing pieces and presenting same to bag-tube and gusset forming sections 116.

The bag-tube and gusset-forming sections are associated with a block bottom forming section comprising parts which are arranged and adapted to operate in a manner precisely similar to that described above with reference to the similarly identified parts of Fig. 9.

In the operation of the last described form of apparatus, the web W is supplied with adhesive in passing the adhesive-applying section 113 and is then fed to the roll pair 126. The side wall reinforcing pieces 93, 94 are simultaneously applied to the web and united therewith in passing between the roll pair 126. When subsequently passing through the bag-tube and gusset forming sections 116, the web W is formed into the required bag-tube with gusset folded reinforced sides. The bag-lengths are then cut from the web and the block bottom of each tubular bag length formed from the bag-tube and reinforcing pieces as the separated bag tubes progress through the block bottom forming section. The bottom blocking patches 101 may be applied from the hopper 73 in the manner above described; when required as a secondary or double reinforcement.

The apparatus described with reference to Fig. 13 may readily be modified for producing the block bottom non-self-opening bag with externally reinforced side walls described above with reference to Figs. 17, 18 and 19. To this end, for example, the web feeding sections may be re-arranged that the bag-tube web is superimposed upon the reinforcing pieces and attached thereto in such relation, while the gusset-forming sections 116 will be dispensed with and replaced by a plain bag-tube forming mechanism 116a (as shown in chain dot outline).

It will be appreciated that the bag producing apparatus in any of the forms described above may include means for feeding the bag-tube material to the bag-tube forming mechanism in pre-cut sheets instead of a continuous web. To this end, the bag-tube material may be fed from a reel and cut off into bag length blanks prior to the formation of the bag tubes therefrom, or may be fed from sacks or hoppers.

Similarly, each of the above described

forms of apparatus may be modified by substituting a web feed for the stack or hopper feed described, or vice versa, for the supply of the reinforcing material.

In any of the above described forms of reinforced bags the reinforcing pieces may be secured to the bag-tube walls at any number of different points of their mutual face-to-face contact and over comparatively large or small areas as desired, but at present it is considered to be sufficient to secure the said contacting faces together only at the bottoms or tail ends of the reinforced bags.

As shown for example in Fig. 2, strips of adhesive a, b, c and d may be applied to the web W so as to extend in two transverse rows across the bottom or tail end of each bag length. After application of the adhesive, the first reinforcing piece 3 is imposed upon the adhesive strip a and the first gusset fold then made, so that the two adhesive strips b are brought face upwards above the reinforcing piece 3, whilst the adhesive strips c are turned face downwards, to contact the upper surface of the bottom fold end of the reinforcing piece 3 of the bag tube. The reinforcing piece 4 is then laid upon the upturned faces of the gusset folds 2 and adhesive strips b, whereafter the second gusset fold is erected to complete the formation of the bag tube while turning the adhesive strips d downwards to contact the outer face of the reinforcing piece 4 and bringing the longitudinal seaming edges of the bag tube into overlapping mutually adhering relation.

As noted above, the bottom of the plain satchel bag shown in Fig. 4 may be sealed with a single or double turn-up fold of the bottom end of the bag-tube and if a double turn-up sealing fold is used, the adhesive strips c may be dispensed with.

It will also be understood that in place of two pieces of reinforcing material as more particularly described above, use may be made of a single strip of material which is folded back on to itself either before or after being applied to the bag-tube material. Thus, for example a single strip of reinforcing material may be transversely folded to produce, in effect, two conjoined pieces one of which is attached to and serves to reinforce the front or rear wall of a block bottom bag, while the other piece constitutes a freely hinged flap which lies against the first mentioned piece when the bag is folded flat and is adapted to swing downwards to cover and reinforce the block bottom thereof when the bag is opened.

The mouths of the bags made according to this invention may be adapted for closure in known manner, such as for instance by sealing by the application of



heat and pressure to heat-sealable films preferably applied direct to the walls of the bag tube, in which case the reinforcing piece or pieces may be arranged to terminate short of the top of the bag tube walls. Alternatively, the reinforcing piece or pieces may be extended up to or beyond the top edge of the bag and adapted to close inwardly over the contents of the bag, thus exposing an area of the bag tube walls at the mouth of the bag for sealing purposes. In a further modified form, the said reinforcing pieces may remain extended for sealing in co-operation with the sealing area at the bag mouth and may be adapted, *per se* for heat sealing.

The means for effecting a satisfactory closure of the bags include the use of adhesive tape, metal clips, staples, stitching, etc.

Means may be conveniently be provided for carrying the bags produced according to the present invention. For example, an aperture cut in the said extended strip or strips would quite well serve this purpose.

The said reinforcing material may have inherent heat-sealing properties, or it may be treated with suitable heat sealing film by coating or applying in strip form at appropriate positions.

Alternatively, or in addition to, the adhesive or heat-sealing film may be applied to the tube-forming web as it is drawn from the reel, or the said web may consist of heat sealing film.

A bag thus made may be stored in flat condition and made ready for use by opening the gusset folds and thereby forming the bag bottom, which in turn may be further reinforced by folding inwardly the extension flap provided for this purpose in one of the reinforcing strips or sheets as hereinbefore described.

Printing or other decorative matter may be applied to the bag with the reinforcing strips providing a good background thereto, or the decorative matter could, with advantage be applied direct to the outer face of one or more of the reinforcing strips or sheets.

It will be clear that by the method of the present invention a well shaped, appreciably rigid pack reinforced at the points of maximum strain can be provided and by using a suitable transparent material for the bag tube such a pack may be formed with suitably reinforced and stiffened areas associated with a display panel or panels.

Although the production of bags from single webs or single sheets of tube-forming material is more particularly described above it will be understood that bags having multi-ply walls may be produced according to the present invention by simultaneously feeding two or more webs

and/or preformed sheets of tube forming material to the bag-tube forming mechanism.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of manufacturing reinforced flat-bottomed type collapsible bags and like containers from bag-tubing, whereby a web or webs or a piece or pieces of flexible bag-tube material is or are mechanically fed to a bag-tube forming mechanism, and one piece or two or more pieces of a comparatively stiff sheet material suitably creased or otherwise weakened for subsequent folding is or are mechanically presented to and brought into face-to-face relation with each bag-length of the bag-tube material so as to become united therewith in the formation of the bag-tube from the bag-tube material and whereby one end of the formed bag-tube and the corresponding parts of the reinforcing piece or pieces applied to the bag-tube are mechanically folded and sealed to complete a bottom for the bag and so that when the latter is opened for use the reinforcing pieces adopt a position wherein to define a flat bottom to the bag and to reinforce the bottom and at least one longitudinal wall of the bag.

2. The method as claimed in Claim 1, whereby the reinforcing pieces are presented to the bag-tube material so as to become attached to the internal surfaces of the formed bag.

3. The method as claimed in Claim 1, whereby the reinforcing pieces are presented to the bag-tube material so as to become attached to the external surface of the formed bag.

4. The method as claimed in Claim 1, 2 or 3, whereby the bag-tube material is fed to the tube-forming mechanism in a continuous web, while the reinforcing pieces are fed from two or more continuous webs and severed therefrom prior to attachment to the tube-forming material.

5. The method as claimed in Claim 1, 2 or 3, whereby the bag-tube material is fed to the bag-forming mechanism in a continuous web, while the reinforcing pieces are pre-formed and fed from suitable stacks or hoppers.

6. Apparatus for carrying into effect the method claimed in any of the preceding claims, comprising means for feeding a continuous web of bag-tube material to bag-tube forming mechanism, means for coating the longitudinal seaming area and reinforcing areas of each bag-length of the web with an adhesive substance, means for bringing a succession of suitably creased or

otherwise weakened reinforcing pieces into face-to-face contact with the adhesive-coated areas of the web, means for forming each bag-length of the reinforced web into the requisite bag-tube, means for applying an adhesive substance to the bag-tube lengths at one end thereof and folding and sealing the adhesive coated ends to form reinforced bottoms to the bags, and means for delivering the formed bags.

7. A modification of the apparatus claimed in Claim 6, wherein the bag-tube material is prefabricated to sheets of the size and shape required for the production of the bag-tubes, and means are provided for stacking the sheets and feeding the stacked sheets in succession to the bag-tube forming mechanism.

8. Apparatus as claimed in Claim 6 or 7, comprising means for feeding two or more continuous webs of reinforcing material, means for transversely creasing, scoring or otherwise weakening the reinforcing material to define fold lines therein, and means for severing the reinforcing material into pieces of the requisite length.

9. Apparatus as claimed in Claim 6, 7 or 8, wherein means are provided for longitudinal creasing and folding the reinforcing pieces for the purpose set forth.

10. A modification of the apparatus claimed in Claim 8 or 9, wherein means are provided for feeding preformed reinforcing pieces from stacks or hoppers to transverse creasing scoring or other fold line defining means and feeding the creased or scored reinforcing pieces to the tube-forming mechanism.

11. Apparatus as claimed in any of the preceding Claims 6 to 8 or 10 adapted for the production of reinforced plain satchel bags, comprising means for applying a reinforcing piece to each bag length or piece of tube-forming material, means for forming a first gusset fold along each longitudinal side of the reinforced bag length or piece, means for applying a second reinforcing piece to the gusset-folded bag length or piece, means for forming a second gusset fold along each gusset-folded longitudinal side of the bag length or piece to complete the formation of the bag-tube.

12. Apparatus as claimed in any of the preceding Claims 6 to 8 or 10 adapted for the production of reinforced block bottom non-self-opening bags comprising means for bringing a longitudinally extending reinforcing piece into face-to-face contact with the adhesive-coated surface of each bag length or piece of tube-forming material, means for superimposing a second longitudinally extending reinforcing piece upon the first mentioned reinforcing piece, means for forming the reinforced bag length or piece into a bag tube and sealing the

longitudinal seam thereof, means for applying adhesive to the bottom or tail end of the formed bag tube and adjacent ends of the reinforcing pieces, means for inserting a bottom blocking patch into the tail end of the bag-tube, and means for tucking-in and sealing off the blocked bottom of the bag tube to complete the bag.

13. Apparatus as claimed in any of the preceding Claims 6 to 8 or 10, adapted for the production of reinforced block bottom self-opening satchel bags, comprising means for bringing a longitudinally extending reinforcing piece into face-to-face contact with the adhesive-coated surface of each bag length of the tube forming material, means for forming a gusset fold along each longitudinal side of the reinforced bag length, means for superimposing a second longitudinally extending reinforcing piece upon the reinforced gusset-folded bag length, means for forming a second gusset fold along each gusset-folded longitudinal side of the reinforced bag length and forming the latter into a reinforced bag tube, means for applying adhesive to the bottom or tail end of the formed bag tube, means for inserting a bottom blocking patch into the tail end of the bag tube length and means for tucking in and sealing off the blocked bottom of the bag-tube length to complete the formation of the bag.

14. Apparatus as claimed in any of the preceding Claims 6—10, adapted for the production of reinforced flat bottom bags, comprising means for bringing reinforcing pieces into longitudinally extending face-to-face contact with each bag length of bag-tube forming material so that the reinforcing pieces cover the side wall areas of the formed bag tube, means for completing the formation of a bag tube from each reinforced bag-length of bag-tube forming material and means for infolding the bottom or tail ends of the bag-tube and side wall reinforcing pieces to produce a bag having a reinforced flat bottom formation.

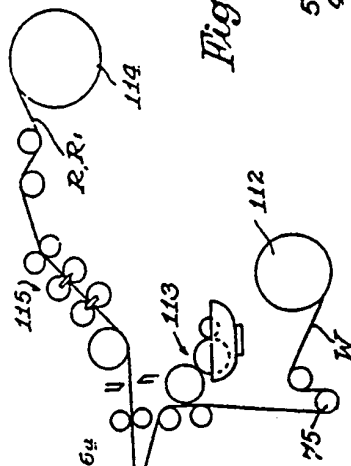
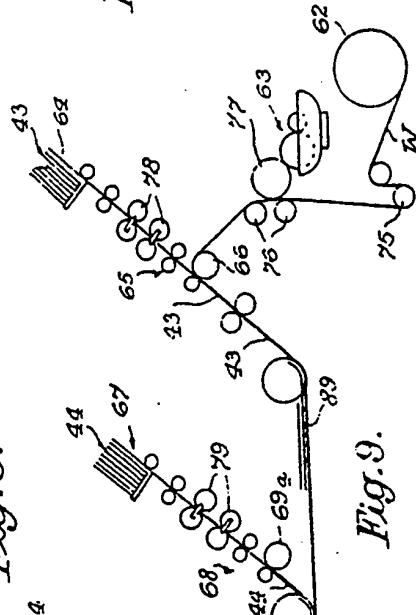
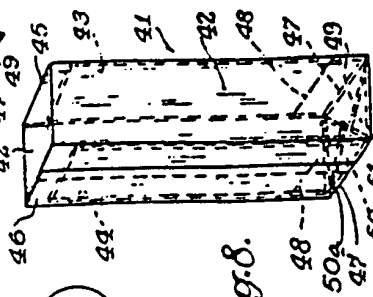
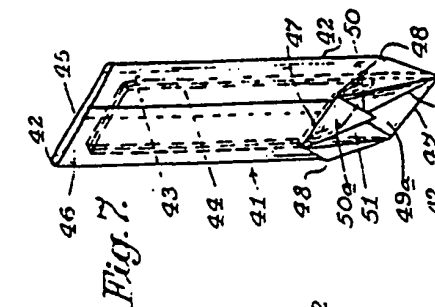
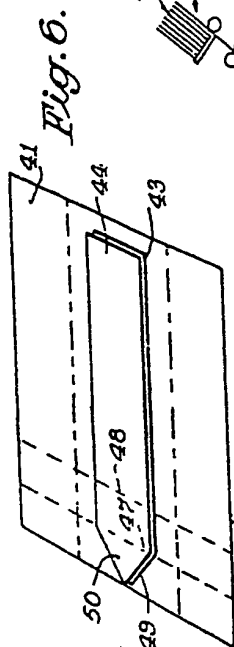
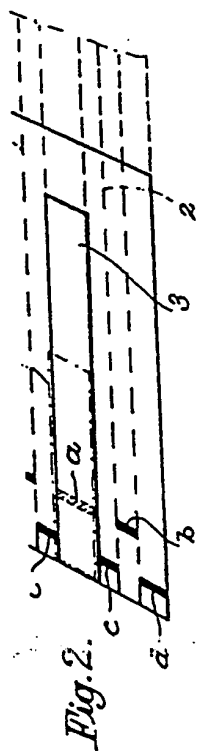
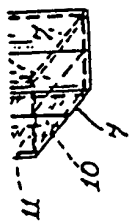
15. Apparatus as claimed in Claim 14, including means for forming longitudinal gusset folds in the reinforced side walls of the bag-tube thereby to produce a self-opening satchel bag with a reinforced block bottom.

16. Apparatus as claimed in Claim 14 or 15, comprising means for inserting reinforcing patches into the block bottom of the tubular bags to provide a double reinforcement for the said block bottom.

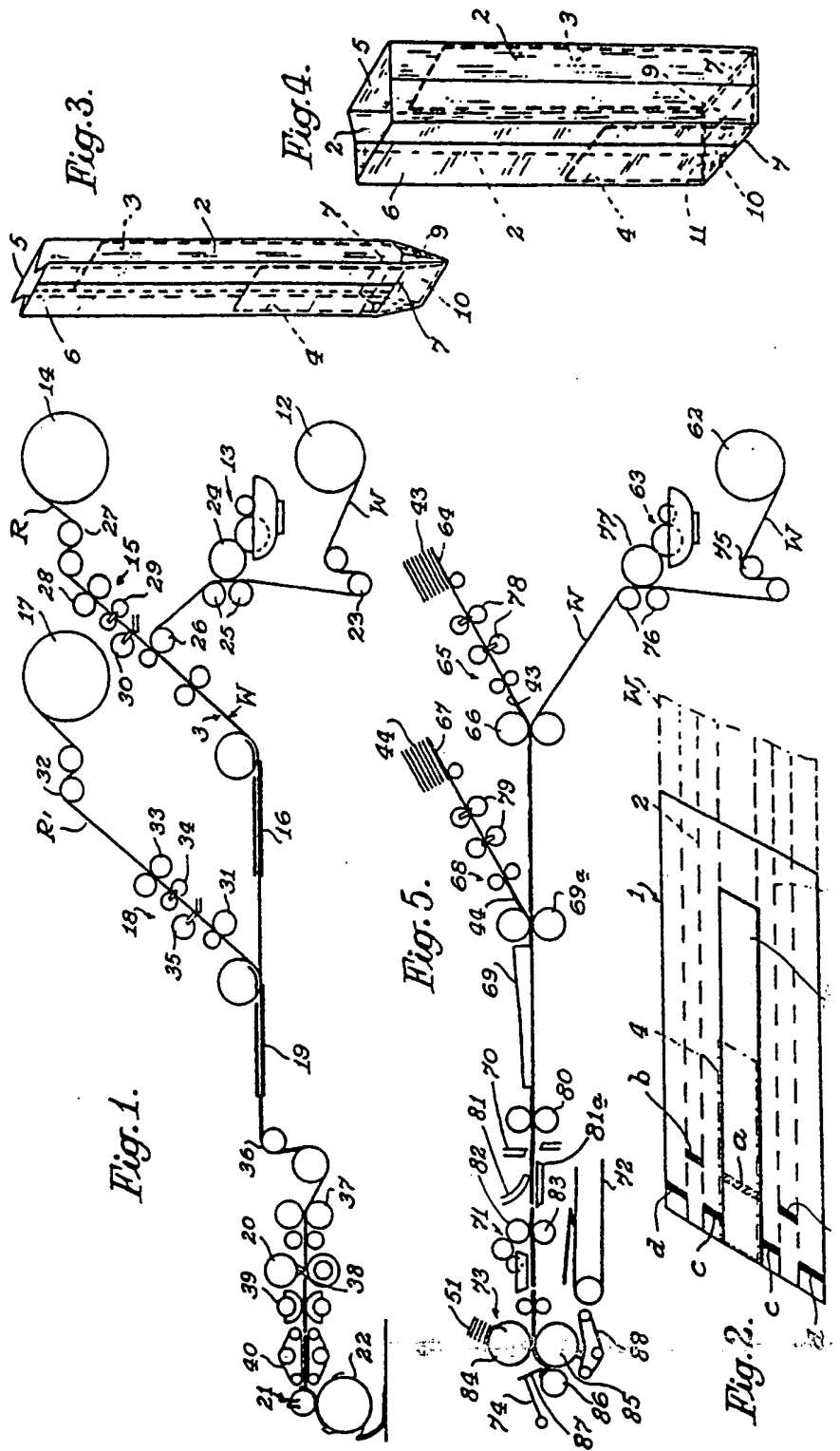
17. Apparatus for carrying into effect the method claimed in any of the preceding Claims 1—5, substantially as described with reference to Figs. 1—4 or Figs. 5—8 or Figs. 9 to 12 or Figs. 13—19 of the accompanying drawings.

18. A reinforced plain satchel bag sub-

SHEET 1



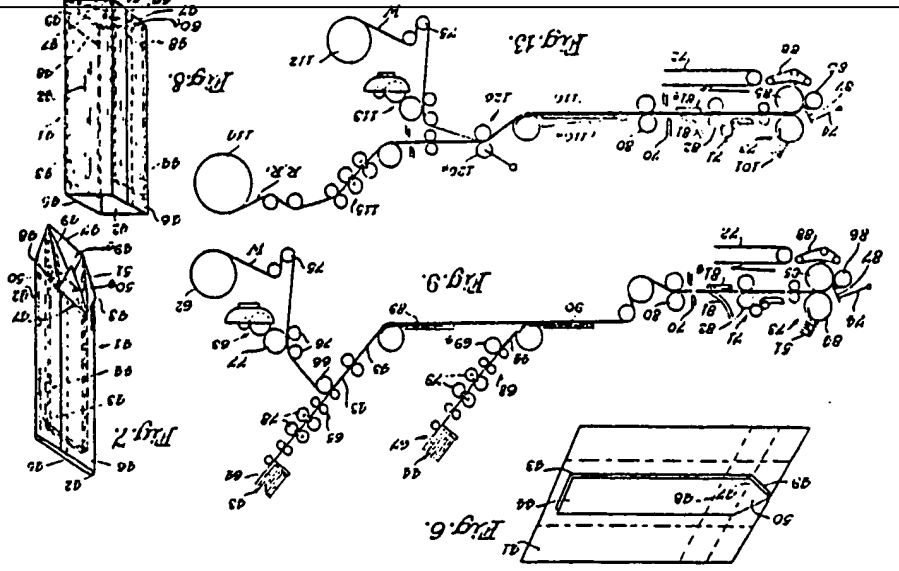
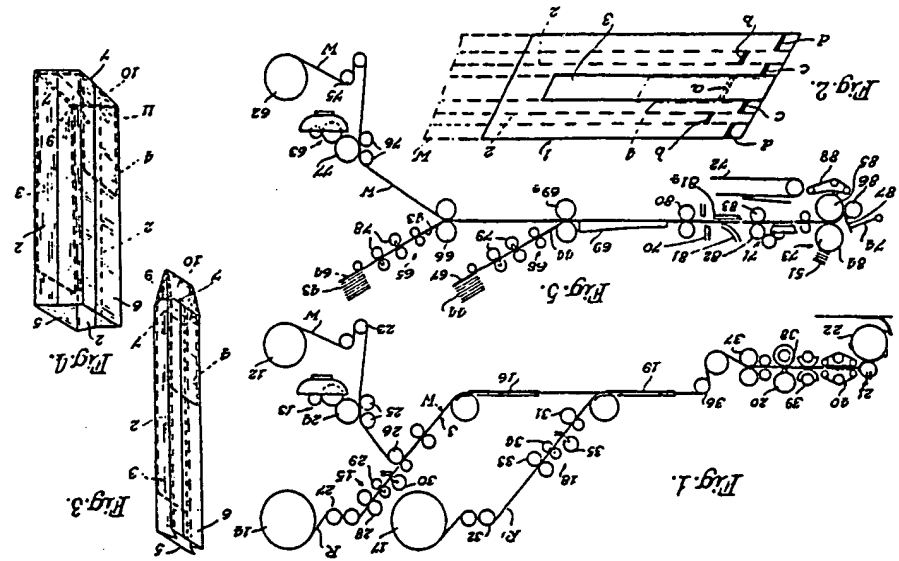
*This Drawing is a reproduction of the Original on a reduced scale*



This Drawing is a reproduction of the Original on a reduced scale

654,460 COMPLETE SPECIFICATION

SHEET 1





This Drawing is a reproduction of the Original on a reduced scale

Fig. 10.

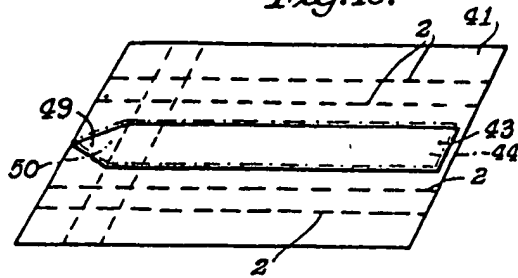


Fig. 11 Fig. 12.

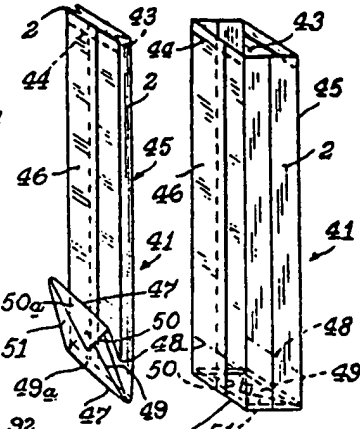


Fig. 14.

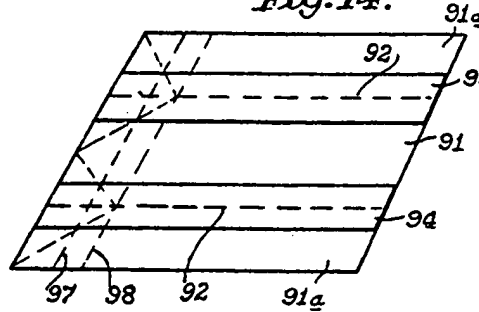


Fig. 16.

Fig. 15.

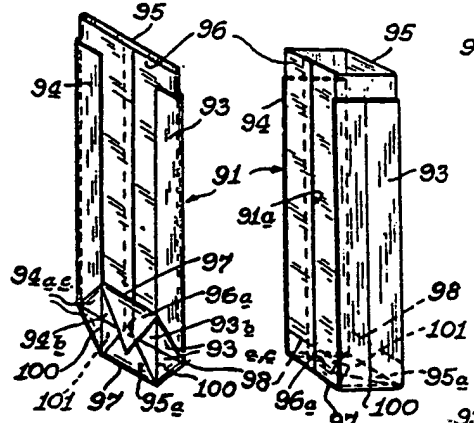
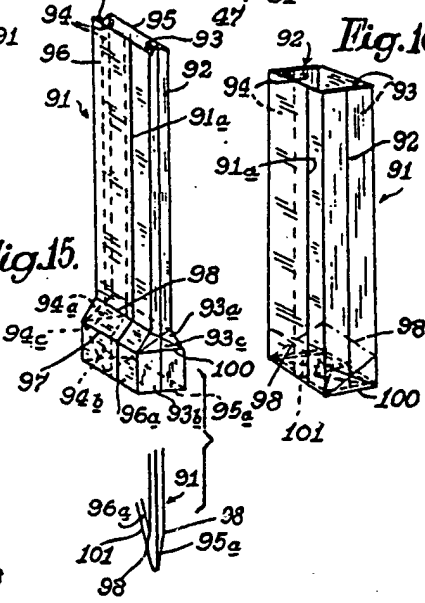


Fig. 18.

Fig. 19.

Fig. 17.

